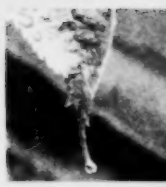

reliable, quality water supplies
for a sustainable economy

Provincial Inventory of Potential Water Storage Sites and Diversion Scenarios (September 2005)

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PROVINCIAL INVENTORY OF POTENTIAL WATER STORAGE SITES AND DIVERSION SCENARIOS

Final Report

(2120-042-00)

Prepared for:

Alberta Environment

PERMIT TO PRACTICE
MPE ENGINEERING LTD.
PERMIT NUMBER: P 3680
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Prepared by:

MPE Engineering Ltd.

September 2005

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September 23, 2005
File:N:\21\20\042\00\L02-1.0

Attn: Mr. Garry Bucharski
Capital Planning Section Head

Dear Mr. Bucharski;

Re: Provincial Inventory of Potential Water Storage Sites and Diversion Scenarios

MPE Engineering Ltd. is pleased to provide Alberta Environment the attached Final Report for the above mentioned study. Thank you for the opportunity to undertake this study and we look forward to working with Alberta Environment on future projects.

If you require further information, please contact the undersigned at 219-6456.

Yours truly,

MPE ENGINEERING LTD.

Harry Schoorlemmer, P.Eng.
Project Manager

HS/db
Attachment

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ACKNOWLEDGEMENTS

Various outside parties provided much research assistance in the data collection stage of this inventory. We acknowledge the cooperation and assistance of the following:

Alberta Environment (AENV); Edmonton, Calgary and Lethbridge
Irrigation Branch, Alberta Agriculture Food & Rural Development, Lethbridge
Irrigation Secretariat, Lethbridge
Prairie Farm Rehabilitation Administration (PFRA); Calgary, Regina
Walter Nemanishen, Retired PFRA
National Archives, Edmonton
Alberta Infrastructure and Transportation, Edmonton
Acres International Ltd.
Western Irrigation District, Strathmore
Eastern Irrigation District, Brooks
St. Mary River Irrigation District, Lethbridge
Bow River Irrigation District, Vauxhall
Ducks Unlimited Canada, Camrose
TransAlta Utilities

1.0 INTRODUCTION

This study to inventory previously identified, potential water storage sites and diversion systems in the province was implemented by Alberta Environment (AENV) to address "Reliable, quality water supplies for a sustainable economy" as part of the provincial "Water for Life Strategy". The study was awarded to MPE Engineering Ltd. in October 2004.

2.0 SCOPE OF WORK

2.1 General

The terms of reference for the inventory required that a "complete inventory of potential reservoir/water storage sites and conveyance systems" be made. The inventory was based on a literature review of previous studies that identified potential sites and no site investigations were conducted. The literature review included Provincial Government departments, PFRA, utilities, local authorities, Irrigation Districts, Ducks Unlimited and files of individuals involved in the water resource field.

Conveyance systems for inter-basin transfers were included in the inventory. AENV recognizes that inter-basin transfers are prohibited by legislation but these were to be inventoried as "this study is intended to summarize historical information…". The terms of reference also required that a provincial map identifying the location of the potential water storage and diversion sites be prepared.

2.2 Specific Requirements

AENV requested that the following specific information be inventoried:

i) Purpose and description of the project.
ii) Location and contour plans of the proposal.

iii) Summary of embankment characteristics including height, side slopes, and crest length.

iv) Summary of the proposed hydraulic structures including design discharge and physical dimensions.

v) Reservoir parameters including Full Supply Level, flooded area and storage volume.

vi) Summary of diversion canals, including location, purpose, dimensions and capacity.

vii) Summary of historical cost estimates for each proposal, including the year the estimate was made.

viii) Summary of available hydrology used for the proposal.

ix) Summary of previous site investigations conducted.

x) Summary of any licensing information that may be available.

In addition to this information it was agreed at the workshop described in Section 3.0 that the following guidelines for inventorying projects were to be followed:

i) Minimum storage requirement is 1000 dam^3.

ii) Diversion schemes with capacities of 1.0 m^3/s or greater to be included.

iii) Storage sites downstream of existing developed sites are to be included, where the potential reservoir does not impact on an existing dam.

It was also agreed that:

i) The cost estimates of projects were not to be escalated to current dollars.

ii) Potential sites submerged by existing reservoirs would not be inventoried.

iii) The most recent study found would be used for the inventory of a particular site.

iv) The option with the greatest potential storage would be inventoried at sites identified with alternative potential storages. (Some reports indicated that the

largest storage alternative was not feasible or not recommended; therefore, in these cases, a smaller storage alternative was selected for the inventory).

3.0 INVENTORY FORMAT

3.1 Data Processing

A "database" methodology had been proposed by MPE Engineering Ltd. to serve as the base method for inventory and storage of the data. This method was adopted as it had the following benefits.

i) Ease of data entry.
ii) Consistent data entry.
iii) Data can be easily summarized and retrieved.
iv) Data can be easily sorted and filtered.
v) Data can be easily imported into GIS software.
vi) Database can be put onto either internal servers or a web site for easy remote access.
vii) Database can be expanded as additional projects are either found or studied.

To maximize the benefit of the database to the stakeholders, a workshop was convened with the AENV stakeholders, early in the study process. This was done to gain their input into its development. Subsequent to this workshop the database and data report formats were developed within the capability of the *Microsoft Access* software.

The database has also been structured to include key drawings (where available) depicting the general arrangement of the project and key infrastructure. The drawings have been scanned and stored electronically in "pdf" format. The database has been set up with a link to the drawing files to enable viewing from within the database.

3.2 Mapping

The input to the database includes the legal land location as well as the project's latitude and longitude. This information was used to locate the potential projects on river basin maps of Alberta provided by AENV (see Appendix C). The maps are saved in *AutoCAD 2000* format to enable importation into GIS software. The 10 principal river basins commonly used by AENV were selected for the primary location identification of a project within the database. These river basins are:

1. Athabasca
2. Beaver
3. Bow
4. Hay
5. Milk
6. North Saskatchewan
7. Oldman
8. Peace / Slave
9. Red Deer
10. South Saskatchewan

The river basins have also been combined into one master map of Alberta. 72 existing crown owned storage and diversion site locations have been added to these maps. 26 non-crown sites have been included as well, however, many more sites would need to be added in the future if AENV requires all existing sites to be shown on the maps. Locating existing sites was not within the project scope of work.

The hard copy maps included in this report do not display all the information that is available in the electronic file due to clarity of presentation. Appendix C summarizes the mapping information available in the electronic format.

4.0 INVENTORY OF POTENTIAL STORAGE / DIVERSION SITES

4.1 Data Sources

The primary sources of data were existing reports and project files. The cooperation of the various offices of AENV, Alberta Infrastructure and Transportation (INFTRA), Alberta Agriculture Food and Rural Development (AAFRD), Prairie Farm Rehabilitation Administration (PFRA), TransAlta (TA), Ducks Unlimited (DU), Irrigation Districts, local authorities and water resource consulting firms was excellent. In spite of this excellent cooperation, data collection proved to be challenging as many libraries and files were incomplete for various reasons. The most common issues for the larger government departments revolved around the many reorganizations of the departments that have taken place and the related moving and storage of reports and libraries. This led to considerable time requirement to track reports and, in some cases, although studies were known to have been done, reports could not be found.

In the case of PFRA, their related files have been put in storage in either Regina or Edmonton. An attempt was made to uncover the reports in the Edmonton archives with limited success. A retired PFRA engineer was retained to review a listing of PFRA files and projects. This was helpful in identifying projects that could be of interest for the inventory. Based on this review and a review of the inventoried projects it was concluded the significant PFRA projects that would be of interest, had likely been inventoried. Consequently a trip to the Regina office was determined to be unwarranted at this time.

Ducks Unlimited have studied many wetland type storage projects. These projects tend to be small and are specifically targeted at wetland development. DU files are located in their regional offices throughout Alberta. Their methodology for initial investigation of potential wetland sites is quite limited and usually the findings are recorded on 3 or 4 pages. DU was very cooperative and reviewed their files in the Camrose office and forwarded over 60 files of potential interest to MPE for review. Upon review it was

determined that only one of the projects qualified for the inventory. On this basis, it was concluded that the expense of further investigations into the DU files in other offices was not warranted at this time.

The recent Milk River Dam study undertaken by AENV, is not included in the database inventory, but rather studies in the area completed much earlier are in the inventory. This approach was necessary as the recent study is not available to the public at this time. The database can be updated when the report is released.

A general mail-out was made to local authorities across Alberta requesting information of potential storage sites. A few replies were received but for the most part the few projects identified did not qualify for the inventory. The most interest by local authorities in the inventory project, originated from Southern Alberta.

The source location of the data inventoried is given in the database to enable researchers to locate the data background in the future.

4.2 Data Quality

The quality of the data varies considerably and is very dependent on the study effort at the time and documentation that could be found. Often the data is incomplete or conflicting, as further studies were completed at a particular site. Also, some sites have been identified by more than one name. The most recent reports were used, but on occasion these were not found until after earlier reports had been used for the inventory. For the most part where duplication was found, the earlier reports were removed from the database.

The documentation of small storage sites with as little as 1000 dam^3 is not very good. Consequently the number of small storage projects included in this inventory is limited.

4.3 Inventory Summary

4.3.1 Use of Database

Appendix A contains a summary of the inventory format and description of the data inputs as to purpose and function. A description of how the database can be used is also provided. This includes how to add new projects as well as describing the types of data searches within the database, that can be undertaken and the report formats that are produced.

4.3.2 Inventoried Projects

A total of 238 projects, consisting of both storage and diversion have been inventoried. In some cases, particularly related to multiple diversion projects, components of the project have been inventoried separately and must be combined together to obtain the information on the complete project. This applies particularly to projects that divert water from one watershed to another with a further diversion to a third watershed.

A summary listing of all the inventoried projects is contained in Appendix B. The enclosed disk includes the entire database, the associated electronic drawing files and the provincial river basin maps with the site locations identified.

5.0 SUMMARY AND RECOMMENDATIONS

The inventory completed is an exhaustive inventory of potential storage and conveyance sites; however, it cannot be considered "complete". Based on the experience of the consultant team, it is known that other sites have been identified, but documentation of these sites has not been uncovered to date. Therefore, this inventory should be considered to be a "live" database with projects added to it as either the documentation is found or new studies are undertaken.

In particular there are likely many more small storage sites that would meet the minimum 1000 dam^3 criteria but which have not been documented to the point that files can be found. Therefore, to obtain this type of data and record it, it is recommended that key agencies that might investigate the potential for sites of this size, be kept aware of this inventory. These agencies should be encouraged to submit their findings to AENV for inclusion of the qualifying projects in the database.

This database should prove to be a valuable source of data to planners to assist in the process of water management, particularly for supply management, as the demand for water grows and climate change impacts occur in the years ahead.